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A New Record of the Nile Soft-shelled Turtle, *Trionyx triunguis*, in Lebanon

Piero Carlino [1], Nahed Msayleb [2], Hasan Hamza [2] and Olivier S. G. Pauwels [3]

Abstract

The Nile Soft-shelled Turtle, *Trionyx triunguis*, has not been documented in Lebanon for several decades, and it was even suggested that the species no longer inhabits the country. We document a record made in March 2019 of a large adult female individual found in an irrigation canal just south of the Tyre Coast Nature Reserve in southern Lebanon. According to locals, young individuals are regularly observed in the Litani River near its outflow in Qasimiyeh, where the newly reported individual was released.

Keywords

Herpetology, turtles, Trionychidae, aquatic fauna, Eastern Mediterranean, Middle East, Lebanon.

Introduction

Kasparek (2001) mentioned that *Trionyx triunguis* has not been reported in Lebanon since the 1930s, and that no reproduction sites are known in this country. In their synthesis on the herpetofauna of Lebanon, Hraoui-Bloquet et al. (2002: 37) wrote: "Apart the old data summarized by Kasparek and Kinzelbach (1991), there is an unpublished record of a specimen from Jisr El Basha near Beirut in 1965, but nothing since then." Venizelos and Kasparek (2006) noted: "Recently, isolated sightings have been reported in Greece, Lebanon and Syria." Shanas et al. (2012: 62) indicated: "In Lebanon and Syria, there are only a few recent records and it is uncertain whether reproduction occurs in these countries (Kasparek, unpubl.)." In the Red List assessment made for the International Union for Conservation of Nature (IUCN), van Dijk et al. (2017) noted "Records from Lebanon are known but current occurrence is uncertain" and "A previous nesting record from Lebanon (Demirayak *et al*. 2002) suggests that nesting may still occur there." The Mediterranean population of *Trionyx triunguis* has been listed as "critically endangered and severely fragmented" under criterion C2a in 1996 by the IUCN SSC European Reptile and Amphibian Specialist Group (Kasparek, 2001; van Dijk et al., 2017), and every new record becomes important to evaluate the current status of the Mediterranean population (Candan, 2018), especially from Lebanon.

During field surveys on the impact of fisheries on sea turtles, supported by the NEMO Project carried out by CIHEAM Bari, we gathered new observations on interactions between fishermen and other chelonians, in particular softshell turtles [Editor's note: CIHEAM is a Mediterranean intergovernmental organization devoted to the sustainable development of agriculture and fisheries, food and nutrition security and rural and coastal areas. One of its four Institutes is located in Bari, Italy.].

Results

On 20 March 2019, refugees from Al Rashidiya Palestinian refugee camp observed a large adult *Trionyx triunguis* (Figures 1-2) in shallow water in a small man-made freshwater aqueduct in Ras al-Aïn (33°13'40.8"N, 35°13'26.4"E), about two km south of the Tyre Coast Nature Reserve and six km south of the city of Tyre (also known as Sour) in Tyre District, South Governorate, southern Lebanon. Intrigued by this species they did not know, they informed soldiers of the Lebanese Army about their discovery. The soldiers caught the turtle, brought it to their base, and immediately called the municipality of Tyre. The narrowness of the irrigation canal where the large turtle was found allowed the soldiers to easily catch it. The same day, on the request of the municipality, one of us (HH) recovered the turtle from the army base and, with the help of the soldiers, released it at the fishing harbor into the Mediterranean Sea. Before its release, the turtle was examined by HH: an adult female, in good health, without any visible injury apart from a

Figure 1. Front view of an adult *Trionyx triunguis* caught in an irrigation canal near the Tyre Coast Nature Reserve, southern Lebanon. Photograph by H. Hamza.

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Figure 2. Postero-dorsal view of an adult *Trionyx triunguis* caught in an irrigation canal near the Tyre Coast Nature Reserve, southern Lebanon. Photograph by H. Hamza.

small scratch on its head. It had a straight-line carapace length of about 85 cm, and weighed about 40 kg. In the morning of the next day the same turtle reappeared on the coast near the release place, and was then caught by a fisherman. On 22 March 2019 at 11 A.M., HH came to pick it up and released it again, this time into Qasimiyeh (i.e., the outflow of the Litani River, the most important river of Lebanon). The release point (33°20'10.06"N, 35°15'7.47"E; Figure 3) lies about three km from the river mouth.

Discussion

Although primarily a freshwater species, *Trionyx triunguis* has been recorded from the marine environment at various localities throughout its wide distribution, including the Mediterranean Sea (Akani et al., 2018; Gramentz, 2005; Taşkavak and Akcınar, 2009), hence the choice by HH of the first release site. The second release site was selected because Government

Figure 3. Litani River in Quasmyeh at the site where the *Trionyx* individual shown in Figures 1 and 2 was released. Photograph by H. Hamza.

officers of the Litani River Authority in Qasimiyeh, who helped release the turtle, mentioned that they regularly observe individuals of this species in this river, especially at the receding of the river level in the summer (June–July). They mentioned, however, that mostly much smaller specimens are sighted, and that such large specimens are very rarely seen. They speculated that finding this individual in an irrigation canal can be attributed to the floods generated by recent heavy rains, which probably pushed it to this area. The Litani River has suffered from profound anthropogenic modifications, and its future is challenged by major threats, including climate change (Ramadan et al., 2013). The numerous gently-sloping sandy banks of the Litani River in Qasimiyeh seem to offer good egg-laying sites. So far no global population assessment has been undertaken for the Nile Soft-shelled Turtles inhabiting the Eastern Mediterranean (Akçinar and Taşkavak, 2017). Our team will keep monitoring the site in Qasimiyeh where the officers claimed observing the species. Hopefully our observations will help generate a detailed survey of the Litani River in Qasimiyeh to determine if it is inhabited by a viable population of *Trionyx triunguis* and if urgent conservation measures are needed.

Acknowledgments

We are grateful to Jérôme Maran (Association du Refuge des Tortues, Bessières) for his help with the identification of the turtle, to Enrico Azzone (CIHEAM Bari coordinator) for making our survey possible through the Mediterranean Coastal Community Project—NEMO, and to the fisherman Khalil Taha, who caught the turtle the second time. We express our gratitude to the mayor of Tyre, Hassan Dbouk, for his logistical and administrative support.

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The Rantoul–Paxton Railroad Corridor: Relictual Herpetofauna and Noteworthy Records

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Introduction

Tallgrass prairies historically dominated much of the Illinois landscape, but now have become some of the rarest natural communities in the state (Schwegman, 1973; White, 1978). This loss has been particularly devastating to faunal assemblages, especially those taxonomic groups with low vagility (e.g., herpetofauna). With most of the historic habitat converted to row crop agriculture, small fragmented remnants have become the last refugia for many relictual herpetofauna populations. In the agriculturally rich Grand Prairie Division, most of the remnant prairie habitats are confined to road and railroad rights-of-way. As such, an examination of the herpetofauna persisting in the linear tract of habitat between Rantoul and Paxton, Illinois was undertaken and is described herein.

Description of Study Site

A 10-mile habitat corridor situated between US-45 and the Canadian National Railway (formerly the Illinois Central Railroad) spans from Rantoul to Paxton, Illinois (and beyond) in Champaign and Ford Counties. The corridor is atypically wide due to the presence of an abandoned interurban right-of-way, but also the construction of Interstate 57, which uprooted plans for a proposed dual highway in the right-of-way after it had already been augmented with additional land. The primary type of habitat is dry-mesic prairie (Handel, 2002), but numerous wet areas also occur intermittently (particularly next to the ballast or roadside).

The vast majority of the corridor is degraded and overgrown, but small, higher quality openings can still be found. Two tracts, Pope Prairie and Paxton Railroad Prairie, are managed by Pope Prairie Preservationists and Grand Prairie Friends, respectively. Pope Prairie is a 9-acre tract at the northern edge of Rantoul (Champaign County) with some prairie remnants, a borrow pit with recovering flora, and several wetlands (Figure 1). Crayfish burrows are plentiful at the site. Paxton Railroad Prairie (1 mi. S of Paxton, Ford County) includes approximately 1.5 acres of original prairie with a relatively large wetland to the south along the railroad ballast. Most of the focal area is within the Vermilion River drainage (Wabash Basin), but a small section north of Rantoul is within the Sangamon River drainage.

Methods

Opportunistic surveying began late spring of 2018 using visual encounters, artificial and natural cover flipping, and auditory surveys. These same methods were practiced sporadically throughout the field season until October. All herpetofauna encountered were recorded using HerpMapper (2019), a global herp atlas and data hub. To augment this investigation, I examined herpetofauna records of vouchered and unvouchered specimens in the Illinois Natural History Survey database for Champaign and Ford Counties to produce county species lists and to verify which species have been recorded in the vicinity of the focal area.

Results

County lists generated from vouchered specimens for Champaign and Ford Counties assembled 38[1] and 19 species, respectively. The field season yielded eight herpetofauna species within the Rantoul–Paxton railroad corridor, including one county record for Ford County (Table 1). However, an additional eight species have been vouchered in the vicinity of or within the focal area (*Ambystoma tigrinum*, *Acris blanchardi*, *Pseudacris maculata*, *Lithobates blairi*, *Lithobates catesbeianus*, *Lithobates sphenocephalus*, *Chelydra serpentina*, and *Chrysemys picta*). The presence of two other Grand Prairie species, *Ambystoma texanum* and *Clonophis kirtlandii*, also seems reasonable despite a lack of proximate records. Furthermore, Table 1 denotes eight species with a lower likelihood of occurrence in the focal area that could potentially be encountered with diligence.

Noteworthy Records:

Pseudacris crucifer—Several individuals were heard calling on 10 May 2018 at 2039 hr from the wetland at the southern end of Paxton Railroad Prairie (Ford County) and an audio recording

Figure 1. Photograph of Pope Prairie taken on 30 May 2018.

1. Eight questionable species were removed from the Champaign County list due to lack of evidence to support their presence in the county (e.g., single specimens, potentially erroneous or vague locality data, lack of suitable habitat, potentially released pets, etc.), many of which happened to be collected by A. R. Cahn with the locality Urbana or University of Illinois. These questionably occurring species were *Ambystoma maculatum*, *Eurycea cirrigera*, *Plethodon glutinosus*, *Lithobates palustris*, *Terrapene ornata*, *Sceloporus undulatus*, *Heterodon platirhinos* and *Pituophis catenifer*.

Table 1. Amphibians and reptiles of the Rantoul–Paxton railroad corridor with county lists for comparison.

Species	Common Name	Champaign County	Ford County	Rantoul–Paxton railroad corridor
Ambystoma texanum	Smallmouth Salamander	■	■	◘
Ambystoma tigrinum	Eastern Tiger Salamander	■	■	◘
Plethodon cinereus	Eastern Redback Salamander	■		
Necturus maculosus (ST)	Mudpuppy	■		◙
Anaxyrus americanus	**American Toad**	■	■	■
Anaxyrus fowleri	Fowler's Toad	■		
Acris blanchardi	Blanchard's Cricket Frog	■	■	◘
Hyla versicolor	**Eastern Gray Treefrog**	■	■	■
Pseudacris crucifer	**Spring Peeper**			■
Pseudacris maculata	Boreal Chorus Frog	■	■	◘
Lithobates blairi	Plains Leopard Frog	■	■	◘
Lithobates catesbeianus	Bullfrog	■	■	◘
Lithobates clamitans	Green Frog	■		◙
Lithobates pipiens	Northern Leopard Frog		■	
Lithobates sphenocephalus	Southern Leopard Frog	■	■	◘
Lithobates sylvaticus	Wood Frog	■		
Chelydra serpentina	Common Snapping Turtle	■	■	◘
Chrysemys picta	Painted Turtle	■		◘
Emydoidea blandingii (SE)	Blanding's Turtle	■		
Graptemys geographica	Northern Map Turtle	■		
Graptemys pseudogeographica	False Map Turtle	■		
Sternotherus odoratus	Common Musk Turtle	■		
Terrapene carolina	Eastern Box Turtle	■		
Trachemys scripta	Common Slider	■		
Apalone spinifera	Spiny Softshell Turtle	■	■	◙
Ophisaurus attenuatus	Western Slender Glass Lizard	■		
Clonophis kirtlandii (ST)	Kirtland's Snake	■	■	◘
Coluber constrictor	North American Racer	■		◙
Lampropeltis calligaster	Prairie King Snake	■		◙
Lampropeltis triangulum	Eastern Milk Snake	■		
Nerodia sipedon	Northern Water Snake	■	■	◙
Opheodrys vernalis	**Smooth Green Snake**	■	■	■
Pantherophis spiloides	Midland Rat Snake	■		
Pantherophis vulpinus	**Western Fox Snake**	■	■	■
Regina grahamii	Graham's Crayfish Snake	■		◙
Regina septemvittata	Queen Snake	■		
Storeria dekayi	**Brown Snake**	■	■	■
Thamnophis radix	**Plains Garter Snake**	■	■	■
Thamnophis sirtalis	**Common Garter Snake**	■	■	■
Tropidoclonion lineatum (ST)	Lined Snake	■		◙
Sistrurus catenatus (SE)	Eastern Massasauga Rattlesnake	■		
	Total Species:	**38**	**19**	**8+**

■ = Confirmed presence (i.e., vouchered in county, documented in this study)
◘ = Moderate likelihood (i.e., vouchered in vicinity)
◙ = Lower likelihood (i.e., potentially suitable habitat present)

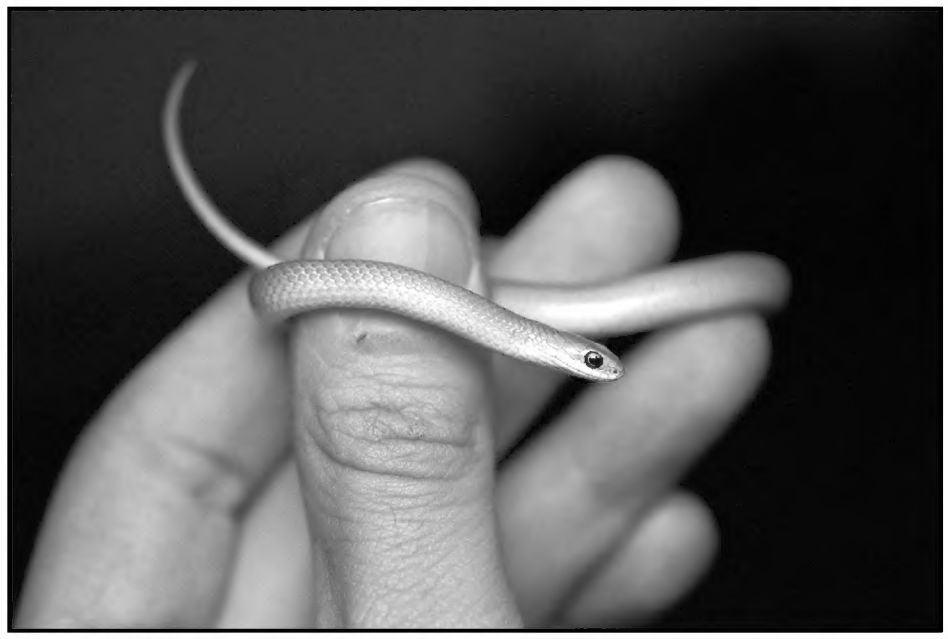

Figure 2. The juvenile smooth green snake (*Opheodrys vernalis*) found beneath a discarded tire in Ford County, Illinois.

was taken for documentation (HM 219601). This species has never before been recorded in Ford County and thus represents a county record.

Hyla versicolor—A single male was heard calling at a small wetland on 30 May 2018 at 2052 h just south of the junction between E 100N Rd and the railway (Ford County). An audio recording was taken (HM 223093). Three weeks earlier, a county record *Hyla versicolor/chrysoscelis* specimen was collected in northern Ford County on 10 May 2018 in Kempton, Illinois. The record herein is from the southern boundary of the county, approximately 37 miles SSE of the Kempton record, and provides audio for species verification.

Opheodrys vernalis—A juvenile specimen (Figure 2) was found beneath a discarded tire between the abandoned "Old US-45" and the railroad on 10 May 2018 at 2005 hr in Ford County (HM 220438). A tissue sample was quickly taken and the snake was released at the capture location. The capture site was a grass-dominated remnant dry-mesic prairie opening with short vegetation (< 0.3 m) nestled in a thicket of sumac (*Rhus* sp.).

Discussion

The herpetofauna of the Rantoul–Paxton railroad corridor is somewhat unique in that it resembles the expected assemblage of the Grand Prairie Division, but also maintains some species (e.g., *Hyla versicolor*, *Pseudacris crucifer*) more typical of the Wabash Border Division (Smith, 1961; Schwegman, 1973). This is probably due to the presence of the Middle Fork of the Vermilion River, which crosses the focal area and may have facilitated the dispersal of some species historically or contemporarily. *P. crucifer* was not documented in either Champaign or Ford County, but my colleagues and I discovered a large population along the Middle Fork in extreme northeast Champaign County (HM 212158; HM 215155) and the small aggregation from Ford County reported here, both representing county records. It is unclear whether or not these discoveries represent recent expansions or relictual populations. Given that only one individual *H. versicolor* was heard calling in the study area, it may not unreasonable to assume the individual was a dispersing male. Indeed, these same hylid species have made expansions in the Chicago suburbs in recent decades (Schramer and Anton, 2018). Certainly, the available habitat in the corridor has become much more wooded and overgrown in the last two decades, possibly promoting this suspected expansion.

The verified presence of the smooth green snake (*Opheodrys vernalis*), a now rare snake in the Grand Prairie, demonstrates the need to survey more rights-of-way in central Illinois for relictual herpetofauna populations. The last and only *O. vernalis* recorded in the focal area was a photograph voucher taken on 22 June 1996 from Paxton Railroad Prairie (Ford County). This species will likely be found along the corridor in Champaign County as well. The study area represents the southern range limit of *O. vernalis* in the state and should be prioritized for conservation efforts accordingly as the genetic stock of populations at the southern reaches of their species' range may be vital for future persistence amidst a changing climate (Hampe and Petit, 2005). Indeed, the largest brood sizes recorded in the species have been from Champaign and Vermilion Counties (Fritts, 1968).

The eight additional species that have been vouchered near the study area (*A. tigrinum*, *A. blanchardi*, *P. maculata*, *L. blairi*, *L. catesbeianus*, *L. sphenocephalus*, *C. serpentina*, and *C. picta*) probably occur in the corridor, with most being verifiable with minimal effort. The presence of *Ambystoma texanum* and *Clonophis kirtlandii* may require more effort. Most wet depressions within the corridor appear suitable for *C. kirtlandii*, but many are becoming overgrown and shaded out by cottonwoods (*Populus deltoides*). This succession may be beneficial for *A. texanum*, but detrimental for the state-threatened *C. kirtlandii*. Kirtland's snake has not been vouchered in Champaign County since the 1950s (INHS 7152; UIMNH 52104), so the discovery of any population would be significant. It occupies open damp areas with an abundance of crayfish burrows.

The eight species listed with a lower likelihood of occurrence in the focal area were included for various reasons. *Necturus maculosus* and *Apalone spinifera* may be encountered in the Middle Fork, but the actual railroad habitat corridor is of little to no use for these species (aside from nesting in the case of *A. spinifera*). *Lithobates clamitans* was notably absent from much of the Grand Prairie Division (Smith, 1961), but it could have potentially extended its range up the Middle Fork drainage as is suspected with *P. crucifer* and *H. versicolor*.

Coluber constrictor, *Lampropeltis calligaster*, and *Tropidoclonion lineatum* are all considered rare in Champaign County with few representative specimens, but may persist in relictual prairie. *C. constrictor* and *L. calligaster* are known from a handful of specimens in northwest Champaign County, whereas *T. lineatum* is only known from several specimens found in Urbana during April of 1889 (Garman, 1890). In Illinois, colonies of *T. lineatum* are typically associated with vacant lots within cities (Smith, 1961), however, the species may also persist in other areas that have largely avoided agriculture (e.g., railroad rights-of-way).

Nerodia sipedon probably occurs in the Middle Fork within the focal area, but whether or not it has colonized any marshes within the corridor remains to be determined. *Regina grahamii* is an extremely secretive, semi-aquatic snake that specializes on eating freshly molted crayfish. Although suitable habitat is

present, its occurrence is more remote due to its apparent absence from the Wabash Basin. If it does inhabit the study area, it would most likely be within the Sangamon River drainage near northern Rantoul where burrowing crayfish are plentiful. The primary burrowing crayfish, *Procambarus gracilis*, was observed at Pope Prairie during this investigation.

Although only eight herpetofaunal species were recorded in the focal area during 2018, upwards of 18 species may actually occur there based on available habitat and zoogeography. Several of the documented species in this study are notable and should be monitored in the future. Handel (2002) summarized the important biological and economic functions of relict right-of-way prairies including acting as dispersal corridors, refugia, and harboring local genetic resources whilst crossing many biotic and abiotic gradients. However, little effort has been implemented in surveying these remaining Grand Prairie refugia for herpetofauna. It is quite unfortunate that most of the remnant prairies that receive any attention at all need be high in floristic quality. Small remnants are scattered throughout the state, but are often not recognized due to their lower quality or disturbed state. Yet, even the rarest herpetofauna find ways to survive in these degraded situations when there is nothing else left. Future surveys of these Grand Prairie refugia must be advocated for they will certainly result in remarkable herpetological discoveries for Illinois.

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Toad Stools: Part Four

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Prologue: This continues my account of an impromptu study of the rococo toad, *Rhinella schneideri*, undertaken during my nearly annual trip to the Chaco of Paraguay and yearly planning for "Proyecto Tagua," the conservation management program for the endangered Chacoan peccary, *Catagonus wagneri*. What follows is taken from my field notes written in November of 2016 during and following a ten-day-long stay.

Ok, so now I have the samples safely in hand and am eager to begin the process of identifying the contents. Besides the obvious bits and pieces that show through the dried remains what else should be done? Brilliant and sparkly beetle carapaces, sharp tarsal legs, loose mouth parts, and odd looking plates, probably wing fragments, stand out like mini beacons inviting further exploration and investigation. Each piece or fragment reflects light in a slightly different way, producing a kaleidoscope of brilliant hues. Knowing that rococo toads are primarily beetle predators helps a great deal. It allows a narrower arthropod target to explore during dissection. But then, what beetle of what type? How to tell them apart? I need a guide, a key, a road map to help explore and identify. Google to the rescue as almost always, the universal electronic tool available to everyone almost everywhere in the developed and developing world and even in some very remote places like Proyecto Tagua in the Chaco.

A word search for Latin American insects brings up a book with a similar title: *Latin American Insects and Entomology* by Charles L. Hogue, published in 1993 after his untimely death. I own it. It is probably in the library at the cabin in Michigan for I cannot find it here at home or at the University. I did have on my shelf at the University, Peterson's "Beetles" which I can use to at least start to discern beetle type from some other arthropod form. An interesting reference and a volume that I note has been used by other authors to identify South American toad stomach contents is a private foundation, governmental publication entitled *Guia Ilustrada de Insectos Communes de la Argentina* by Brewer, published in Argentina for the Ministry of Culture and Education in 1984. If it was used by other researchers for other toad species predation studies, then I should have a copy to use too. Now the search begins in earnest, the hunt is on. This is a known tool, an aid that will make the identification of the stool contents *mas facil*, much easier, or so it would seem.

Published in 1984 for the Ministry of Education by Fundacion de Miguel Lillo in San Miguel de Tucuman, Argentina, pretty much assured me that I would not be able to find a copy that was available and for sale at any price. However there was a link to SIDLAC, Servicio Nacional de Sanidad y Calidad Agroalimentaria, the National Service for Health and Quality of Agronomy Products. One could apply or request use of the guide through the service. This was my first request.

I continued searching and through a generally available library search found out there were copies in several libraries in the United States, the closest being the University of Illinois at Champaign Urbana. Once I knew this I could use the library service that is available to me through DePaul, ILLiad, an interlibrary loan system where article reprints can be obtained electronically and similarly, books can be obtained through interlibrary loan. I filled out the request form and provided in the comments section where I knew there was a copy of the book. I was confident that I would hear back within a week or less which is the norm. In this case I heard back the same day. The library politely shared via an anonymous electronic message that it was unable to help me because I could help myself. Really? Who knew? Turns out there is a service I had not known about, let alone ever used, called CARLI. This stands for Consortium of Academic and Research Libraries in Illinois and is 134 institutions strong with 14.7 million bibliographic records. I know, some of you are thinking I was born in the Middle Ages. No I wasn't, but sometimes I feel as if I should have been.

I went off with the web address to make connections with CARLI and somehow managed to fumble my way through the system and register. DePaul participates in this multi-library system so it was pretty straightforward once I understood what I was being asked to do. I find that not infrequently I have trouble understanding what I am being asked to do by an electronic system, probably because I believe my way of thinking and doing things is more intuitive. Long story short, I got registered, made my request for the book to be loaned to me at DePaul and waited for the system to do its thing. One way or the other I knew that had a high probability of getting the guide to common insects of Argentina which I could use to help ID the stool contents of Paraguayan toads. Now it was time to be patient, at times not one of my strong suits.

It's here! I picked it up today from the interlibrary loan desk at the Richardson Library at DePaul. The guide to common insects of Argentina is a soft cover 131-page gem, exactly what I needed to help identify the insect contents of the toad stools collected in Paraguay. I immediately made a copy of the guide so that I would have my own reference available whenever and however needed. Line drawings identify major groups of insects, including our *sapos*' favorite food, beetles. Keys allow one to narrow down the type of insect and to identify major groupings. I was now one step closer to unraveling the riddle of who had been eaten under the *estancia* lights.

Next comes retrieving the stored samples and determining which is the best method for breaking apart the dried samples without destroying any of the contents. Usually I would simply break apart the stool and sort through the smaller pieces using a dissecting microscope as a magnification aid. In this case it appears that this technique, while usually useful and the first

choice to use, may not be in this case. It appears that the austral sun and I did such a good job drying out the samples that they are near rock-hard and will need to be softened before being broken apart. This can be accomplished with the use of a seventy percent solution of alcohol which simultaneously loosens the stool pellet contents and preserves them. Time to loosen and pickle *sapo* stool samples. More to follow.

Acknowledgments

Juan Manuel Campos, the Director of the Chaco Center for Conservation and Research, Ivan Benitez and Victor Robles of the scientific staff there, each shared in the experience and contributed in various ways. Jeff Holland was a welcome travel companion and colleague. The Scott Neotropical Foundation generously supports efforts at the Center and continues to encourage Chaco conservation and natural history research. Finally, to my colleague and friend, Kurt Benirschke MD, who introduced me to the Chacoan peccary and our need to protect it. I am forever grateful.

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Possible Parthenogenesis in the Two-striped Garter Snake, *Thamnophis hammondii*

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Parthenogenesis has been recorded in four species of *Thamnophis*: the Checkered Garter Snake, *Thamnophis marcianus*, and the Wandering Garter Snake, *Thamnophis elegans vagrans* (Schuett et al., 1997); the Sierra Garter Snake, *Thamnophis couchii* (Germano and Smith, 2010), and the Plains Garter Snake, *Thamnophis radix* (Murphy and Curry, 2000). Evidence presented herein suggests the Two-striped Garter Snake, *Thamnophis hammondii,* as another species of *Thamnophis* for which parthenogenesis may occur.

The San Diego Zoo herpetology department received four female *T. hammondii* in 2012 from Eastern Illinois University. Eastern Illinois University completed studies with *T. hammondii* in which adult females, who had been paired with males in successive weeks during breeding season, produced neonate individuals. It is not uncommon for species of *Thamnophis* to retain sperm long-term, and evidence of sperm storage has been recorded in the Red-sided Garter Snake, *Thamnophis sirtalis parietalis* (Friesen et al., 2014). The above-mentioned research was conducted in 2009–2010, and it's entirely conceivable that these females were inseminated during those brief periods, and sperm stored.

Each of the four females has passed slugs, stillborn neonates or live neonates since having been acquired by the zoo. Since 2012, the female snakes have yearly produced slugs, stillborn and live neonates. There have been several live neonates born with abnormalities such as an enlarged eye, and congenital spinal deformity. There have been four live births in total, but only two have successfully lived past six months in captivity. The other two neonates died in captivity due to the malformations.

Unfortunately the neonates and stillborn were too small to be sexed during pathology and acquiring molecular genetics has not been a possibility. Due to the evidence above, it can be argued for parthenogenesis in *T. hammondii.* Future tests using molecular genetics would be necessary to accurately determine parthenogenesis in this species.

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Some Natural History Observations and Photos of the Nesting Behavior of Desert Tortoises in Arizona

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I saw my first-ever wild Sonoran Desert Tortoise (*Gopherus morafkai* [hereafter called GOMO or tortoise]) nest on 19 June 1993. (At that point in time, all tortoises in Southern Arizona were designated as *Gopherus agassizii*, or GOAG. So, thanks to the perennial name-changing game-changers, we are already confused right at the onset of this article as to what the hell to call these things. We stick with GOMO, and stay current in describing something that happened nearly 26 years ago.) Speaking of 26 years ago, I was playing a bit part in my very first full-blown GOMO study the day I saw the nest. The study was being led by Roy Murray, who took it upon himself to get married several years later, and changed *his* name in the process. So, shall I call him "Roy Averill-Murray," or "Roy Murray" from this point forward? Why does everything have to change all the damn time? Is there nothing constant in this world anymore? We shall simply call him Roy for Round 1 of this column, and go for the full blown Roy Averill-Murray for Round 2. Whew! This article is already getting complicated!

Roy's study was to fulfill, in part, the requirements of his masters degree from the University of Arizona. He actually left the confines of the U of A shortly after his field project was complete, and went off to some sort of umpire school with aspirations of becoming an umpire for Major League Baseball. He quit that notion shortly after, citing: "Too many rules in baseball!" He got back into his studies on an animal that might possibly have less rules than the sport of baseball. (I'd call it a draw myself.) He came back to the University of Arizona, and eventually earned his Ph.D. He is currently the Desert Tortoise Recovery Coordinator for the U.S. Fish and Wildlife Service, based in Reno, Nevada.

Getting back to 26 years ago, Roy's study was on nesting GOMO. That is probably why I saw my first wild GOMO nest while participating in his study. He was doing his work near the Mazatal Mountains, roughly 40 miles northeast of Phoenix. Roy had glued transmitters to the carapaces of several female GOMO, and was keeping close watch on them. It was the job of those who were assisting him in the field to radio-track these females, bag them, and bring them back to where the vehicles were parked. Roy had an X-ray machine set up there. In order to get them to sit still long enough to get an X-ray, we would duct tape the GOMO into their shell, and balance them on a coffee can. The camera, which was mounted to a highly adjustable tripod, would be positioned directly above the GOMO. The trigger mechanism had a timer, which allowed us to run like hell to the opposite side of the vehicles as soon as the shutter was activated. We all had to sign waivers that said we wouldn't sue the U of A if we suddenly stopped crapping proper. (I haven't crapped proper since, but that could be diet-related). I don't think the tortoises were very happy with the whole procedure. At one point in time, I was carrying five of them. I had two in bags in each hand, and one in my backpack. The one in my backpack screamed at me during the mile long hike to the vehicle. While I have heard tortoises vocalize many times, this was the only one to ever scream at me. (It was a high-pitched and continuous "S-c-r-e-e-e-e-e-e" that lasted about 30 seconds, with brief pauses for long enough for the tortoise to catch her breath before emitting the next one). But they all survived the experience, and the X-rays revealed who had laid eggs, and who had not. There was certainly no surer way to know not only whether or not they had oviposited, but also, how many eggs each was carrying. For the record, it should also be stated that the Mazatal Mountain GOMO study continues to this very day, under the watchful eye of Cristina Jones, who is currently the Turtles Project Coordinator for the Arizona Game and Fish Department. The methods are now far less stressful for the GOMO under watch. And the GOMO that were flourishing then are still flourishing now. The place appears to be in good hands.

While this column is suddenly going the direction of name-dropping, when it comes to tortoises, I have not yet begun to drop names of the people I worked with during my early years as a tortoise nerd. I worked with most of the local heavy hitters in the tortoise world during the 1990s. All were grad students at the time. It was a matter of timing and good luck on my part. Speaking of timing and good luck, they happened to choose the one aspect of herpetology that later morphed into lucrative careers. And speaking of name-dropping, I should mention that on the afternoon of 19 June 1993, I was with Dr. Cecil Schwalbe when I saw the nest. Dr. Schwalbe was Roy's adviser. He also wanted to be in on the fun of it all. Cecil was doing the radio-tracking on this day, and I was along to help carry any tortoises that required an X-ray. The first GOMO we tracked this day was number 19 in the study. The X-rays had revealed that Number 19 had dropped her eggs the week before, on 12 June. As we approached her presumed nest site to the steady tune of blips and static, we first saw the flagging that hung above the boulder she had been captured under on that 12 June date. We were at distance of perhaps 20 meters from the burrow when the flagging was noted, and if there were any doubts that she was still home, they were dispelled when good old Number 19 came barreling out of the burrow beneath the boulder. She gave pause for long enough to give us a couple of head bobs, and then charged directly at us. As she advanced, she was vigorously head-bobbing and woofing at us. She was *clearly* not happy to see us. This remains the *only* time I have ever seen a wild GOMO do this sort of thing. With well over 5,000 observations of wild GOMO under my belt, mention of such things as screaming and aggressive attack behaviors might indicate how atypical things were becoming at this study site. We allowed her to enjoy her attack to the point that she actually covered the ground the between us before Cecil scooped her off that ground and bagged her. He then began to process her, and told me to find the eggs while he did so. I reached deep into the hole under the boulder, and began to gently finger the soil there. It seemed

Figure 1. Sonoran Desert Tortoise (*Gopherus morafkai*—"GOMO") "Rob" viewed roughly 60 cm deep in her nesting burrow, 15 June 2018. Five other GOMO were under watch in their burrows at the time. Hurricane Bud hit the Tucson area that evening, bringing on some rare June showers.

hard-packed, so I began to work forward. Once I got flush to the burrow edge, the soil suddenly got soft. I removed two handfuls of soil from that area, and the top of two eggs came into view. As soon as that happened, Cecil advised me to cover them back up. Neither of us thought to photograph the event. We just covered them back up, and that was the end of that!

Through the years that have followed, I have found several female GOMO that were likely nesting. There was never an effort to dig, or monitor these any further. It wasn't until 15 June 2018 (25 years after the first wild GOMO nest was encountered) that another opportunity arose. I was at Iron Mine Hill on this evening. Rob Winward was with me. Rob pointed out a burrow that he had seen a GOMO in a few days earlier. We checked that out, and found nothing. As we had just seen a Tiger Rattlesnake (*Crotalus tigris*), Rob quickly drifted off to seek more. I stuck with the boulder that Rob had pointed out, and worked my way around to the east side of it. Sure enough, there was a large GOMO that was ~60 cm deep under the boulder, facing out of the soil burrow that was beneath it. I snapped a quick photo, showed it to Rob, and we moved on (Figure 1). I named this GOMO "Rob," just as a way to differentiate it from the other five GOMO under watch during that time period. On 16 July, I was once again with Rob, and once again, found Rob the

Figure 3. 20 July 2018. Mamma Rob taking a peek at what is going on outside her nesting burrow. Her lips were once again stained green at the time this image was taken.

Figure 2. Rob as viewed in her nesting burrow on 16 July 2018. It was at this point that the author realized that he *probably* had a nesting female GOMO under watch. I should have named her "Robin," but there is enough name-changing going on in this article. A further indicator that Rob was likely a nesting GOMO is that all five of the other tortoises under watch cleared out of their burrows after hurricane Bud hit. Tortoises are good mothers, often staying with their eggs until near the time they hatch, roughly 100 days after being oviposited. What the image will (sadly) not show is the fact that her lips were stained green. This is the result of Mamma Rob occasionally leaving the nesting burrow to feed. Note also that Rob is doing some digging in this image. Oviposition was likely occurring when this image was taken. According to Roy Averill-Murray (pers. comm.), based on the X-rays, egg-laying averages from mid-June to late July, and as late as 23 August.

GOMO to still be in the same burrow as she was on 15 June. She still occupied the exact same rear portion of the burrow that she had been on 15 June, but her lips were green, indicating that she had been out of the burrow for long enough to feed (see Figure 2 and caption for further information). I returned to Iron Mine Hill on 20 July, this time with my German friend Jochen Schwandt, who is in the process of getting a book published on Gila Monsters (*Heloderma suspectum*). While we were seeking HESU, we stopped to visit Rob. For this visit, she was viewed with roughly one-third of her body out of the edge of the burrow, facing out (Figure 3). The next time I checked on Rob was 24 September. She was in her usual place, in the back of the burrow (Figure 4). On 9 October, another visit to Rob tran-

Figure 4. 24 September 2018. Green lips and all, Rob returns to her post. She is poised directly on top of where her eggs are buried. Other tortoises under observation have shifted in and out of burrows for the entire summer. The summer rains of 2018 were extraordinarily kind, and this is the season that most tortoises show the most surface activity. Mamma Rob is proving to be a good mother by staying close to her nest, leaving only occasionally to grab a meal.

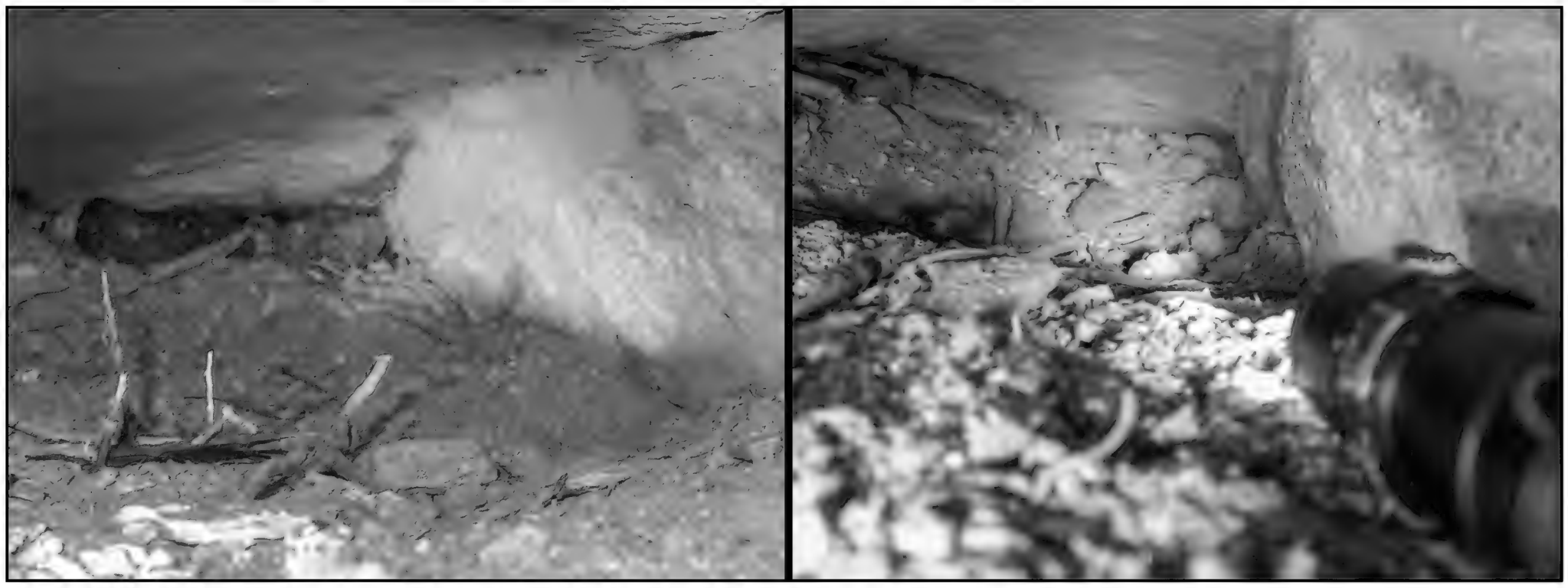

Figure 5. **Left**: 9 October 2018. Rob finally clears out of her nest site. **Right**: 6 December 2018. The reader is encouraged to look carefully at the two images. Note the level of the sandy soil in each image. In the left image, the soil to the rear of the burrow is level with the soil closer to the entrance. In the image to the right, the soil at the rear of the burrow is depressed, several inches lower than the soil in front. It makes sense that *if* hatching occurred here, the volume of soil under this portion of the burrow would be diminished.

spired, but this time, she had cleared out of the burrow. And finally, on 6 December, I visited Rob's burrow for the last time (see Figure 5). On that day, I also found a roughly one-cm-square egg fragment (Figure 6). While my smoking gun that nesting had occurred here was not much to behold, it is still a damn sight better than the *nothing* that I have to show for my 1993 observation. This column should probably end here, with the image of the fragment in my hand. (I still have that egg fragment, in the event that someone wishes to examine it.)

But what I *really* wanted out of this observation was to be able to show a *complete* series of natural history images of the nesting sequence of a wild GOMO. With that in mind, on 12 December, I emailed about a dozen of the greatest GOMO Jedis in the nation. I explained everything I saw, showed the images you can see below, and described what I *didn't* see as well. The single most important thing I wanted to know was whether or not this was a successful hatching event. I have seen images of GOMO nests that have been predated, and those show eggshells scattered all over the place, both inside and outside of the burrows. The lack of that sort of thing appearing, as well as no sign of the soil inside the burrow being disturbed, seemed to eliminate that possibility. What really bothered me was the fact that if there *was* a successful hatch, why did I not see any of the eggshells? Surely, as the hatchlings crawled out of the dirt they were buried in, would they *not* leave some evidence behind? The possibility that eggshells sometimes cling to the carapaces of hatchling tortoises was brought up by Marty Feldner and John Slone. They both had yard tortoises that went through the nesting and hatching process (see Figure 7). So, yeah, it's possible that the wee ones carried their eggshell fragments out of the burrow on their backs. My other question was on the timing of the hatch. Once again, both Feldner *and* Slone came up with a perfect match: eggs laid in July, and hatching near the end of October. If that was the best thing to come of his inquiry, it would have been good enough. But Dr. Roy Averill-Murray came through with something even better (see Figure 8). Roy also asked me permission to use my images of Rob in her nesting burrow. It seems that, as I noted with my 1993 observation above, they were a little lax with taking pictures with some of

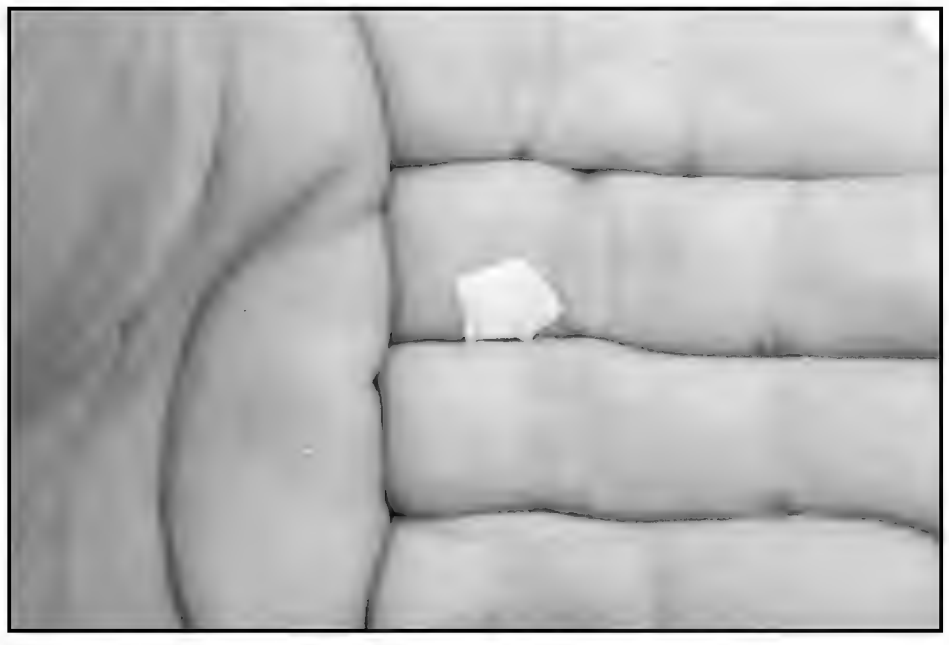

Figure 6. 6 December 2018. This eggshell fragment is the only other smoking gun to be found in Mamma Rob's nest site. The fact that Rob remained with the burrow throughout the most active period of a GOMO's year; the digging that was observed in July; the depression in the soil that appeared after the normal hatching period (see Figure 8); and finally, the egg fragment in this image—all point to a successful reproductive effort. Figures 1–6 are all by the author.

Figure 7. One possible reason that there were not more eggshell fragments in the burrow is that any fragments remained clinging to the carapaces of the hatchlings as they egressed from their nest site. This image, by Martin J. Feldner, is of a hatchling from one of his female yard tortoises.

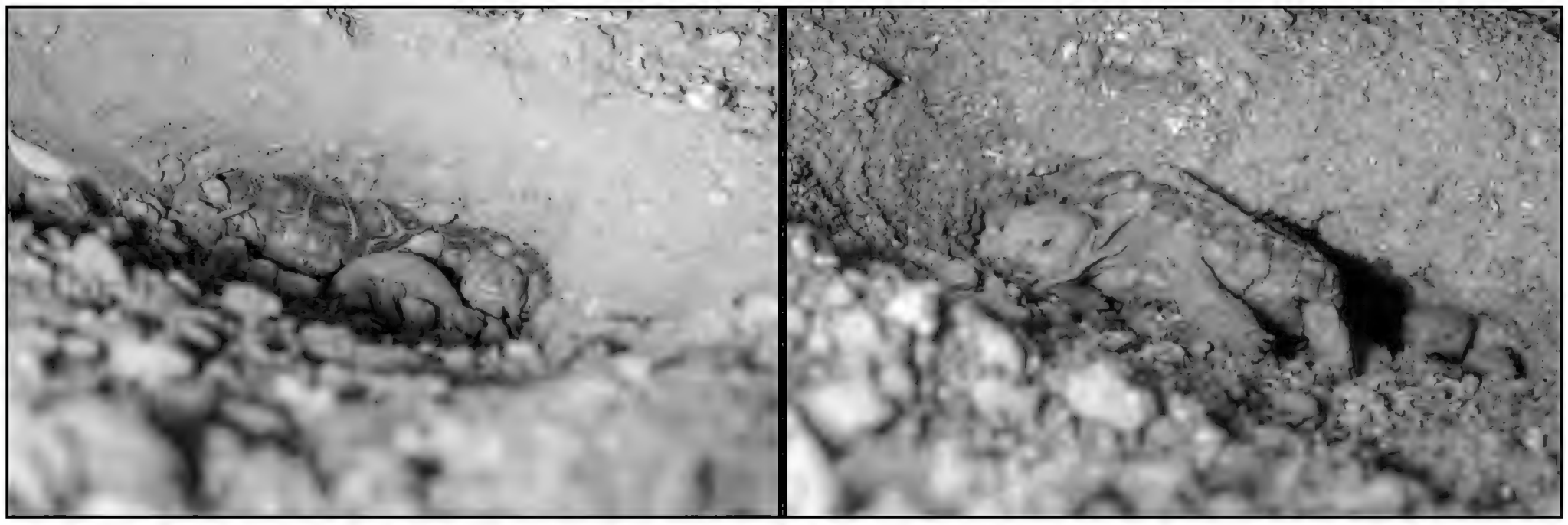

Figure 8. **Left**: A very rare image of two wild hatchling tortoises emerging from their nest. The date this occurred was 21 October 1998. **Right**: Yet a third hatchling emerging from the same nest, 29 October 1998. Both images by Roy Averill-Murray.

the nesting phases of the GOMO under watch. But in the end, Roy got the best of it all. I also asked Roy if I could use *his* images someday. This he blessed me to do. The most amazing thing about Roy's images is how nicely they dovetail with mine. One could easily imagine that Roy's Figure 8 photos came from my nest. They *do* look very much like they could be from the exact same hole. There is one more amazing aspect to the results of my efforts to contact the local GOMO experts. I got three different peer-reviewed papers on the subject matter. They were all exquisitely done, loaded with tons of data and charts. But not a single picture of the nesting process could be found in any of them. I'm not saying that a complete series of images of GOMO nesting doesn't exist somewhere. I'm just saying that those of us in the CHS now have a pretty good sequence at our fingertips.

The one thing that could have happened (some would say "*should* have happened"), was for me to do a little digging toward the rear of Rob's nest site. There was ample opportunity to do this, both after Rob moved out the nesting burrow, and after the eggshell fragment was discovered. I had the necessary permit to make such an action legal. (Heck—legally speaking—I need the permit just to keep the egg fragment in my possession). But in retrospect, there was really no need to disturb anything to get what I was after. In the end, I wound up getting what I was seeking—a complete nesting sequence of a wild GOMO. As long as I kept my hands to myself, there was no way I could be blamed for anything that might have gone wrong. Meanwhile, by the time this issue of the *Bulletin* is in the readers' hands, the next nesting cycle of the local tortoises will have begun. I earnestly look forward to seeing what the near future will bring in this regard.

This here is Roger Repp, signing off from Southern Arizona, where the turtles are strong, the snakes are handsome, and the lizards are *all* above average.

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What You Missed at the April Meeting: Chris Lechowicz

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I know few herpers who wouldn't want to encounter an indigo snake (*Drymarchon* spp.) either in the wild or in their home. North America's largest snake (argued by advocates of *Pituophis* spp.) is a beautiful, charismatic, and gentle snake that field herpers long to observe and breeders love to breed. It was with much anticipation that we looked forward to hearing what our April speaker had to say about them. Especially since that speaker was Chris Lechowicz.

I'll steal from our website biography in case you don't know Chris:

> Chris Lechowicz is a long-time CHS member who grew up on the southwest side of Chicago and in the Chicago Herpetological Society. He has two Bachelor of Science degrees (one in zoology and the other in computer science) from Southern Illinois University at Carbondale and a Master of Science degree in environmental science from Florida Gulf Coast University. He is the director of the Wildlife & Habitat Management Program and staff herpetologist at the Sanibel Captiva Conservation Foundation (SCCF) in Sanibel, Florida, where he has worked for over 16 years. Chris is co-author of *Amphibians & Reptiles of Sanibel & Captiva Islands: A Natural History* (2013) and has a natural history website <graptemys.com> dedicated to map turtles (genus *Graptemys*). Chris's current herp research at SCCF involves Florida box turtles (*Terrapene carolina bauri*), ornate diamondback terrapins (*Malaclemys terrapin macrospilota*), and eastern indigo snakes (*Drymarchon couperi*).

There's much more. He's a past president of the CHS. He's a turtle guy who's an expert on map turtles. He's an I.T. specialist. He's a musician. He's a dedicated father of two boys. He breeds lots of animals. He hates Apple products and thinks people who use them are slightly below average in intelligence. This last I know because he is a good friend of mine with whom I've spent many hours; and I'm writing this on my MacBook Air. Oh, he's also a good speaker.

Chris Lechowicz. Photograph by Dick Buchholz.

Chris started with photos of family and friends, including many long-term members of the CHS. He garnered laughs with word balloons added to his PowerPoint photos and managed to reflect credit on his family and many CHS members even while poking fun at everyone and himself. He talked of the long history of his employer, the Sanibel-Captiva Conservation Foundation, a private organization that maintains conservation lands on Sanibel and adjacent islands in Florida. But his main subject was his indigo project.

Chris gave us a brief description of indigos, the largest snakes in the United States. While they have been measured up to 8.9 ft., average males are 6–7.5 ft. and females 5–6.5 ft. Shiny black/blue, stocky bodies, usually with reddish lower jaws and necks, and covered with large scales. Chris complained that most "sightings" he receives of indigos turn out to be southern black racers (*Coluber constrictor priapus*), a much smaller black snake that is very common in southern Florida. Indigos are now federally protected as well as being protected in all states where they occur. While their association with the burrows of gopher tortoises (*Gopherus polyphemus*) is often cited, Chris says that the relationship is more common in the northern portion of the indigos' range. In his area they tend to move to upland habitats in the winter and relocate to lowlands in the summer, frequently hanging around mangrove edges. We saw nice photos of a variety of habitats, including agricultural land, which surprised me. Chris says that the snakes will go where the food is. Feeding mostly on snakes, indigos are attracted to the areas that have food for snakes, and many "developed" areas provide ample rodents and insects for snakes to eat. The indigo's diet may also include lizards, frogs and toads, fish and invertebrates, and even hatchling turtles.

Indigos are winter breeders, and the females can store sperm for up to four years. Clutches range from 4 to 14, with the northern popula-

Chris (left) with his mentor, Ron Humbert, demonstrating one of the hazards of fall herping in southern Illinois—beggars' lice, burr-like seeds that cling tenaciously to most clothing. They're also holding a red milksnake. I suspect that all who knew Ron will really like this picture. Photograph by Nicole Lechowicz.

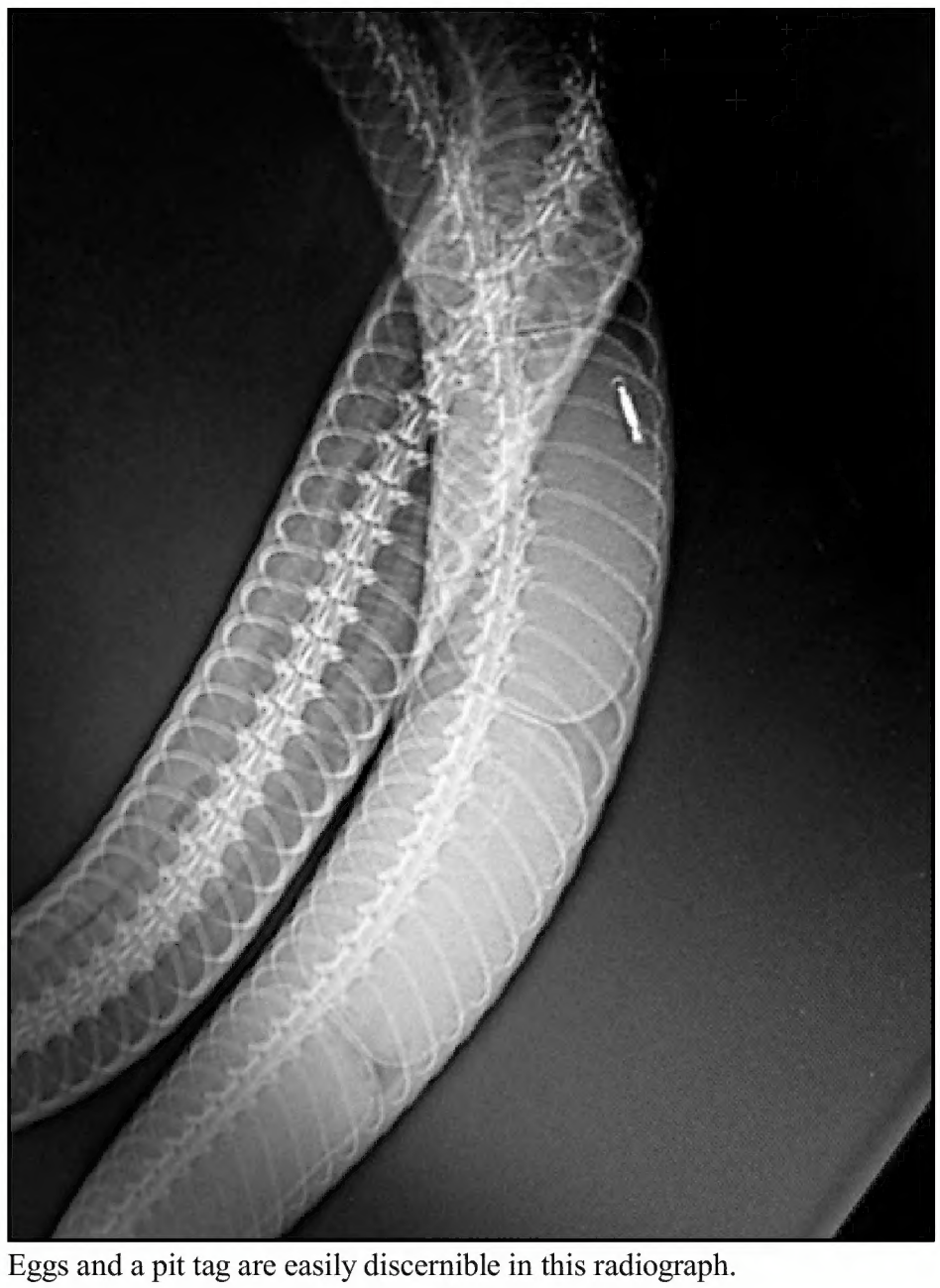
Every once in awhile we should see a picture of our editor. I suspect that everyone who knows Mike will really like this picture. Photograph by Chris Lechowicz.

One of Chris's helpers, Patrice Pravato, giving scale to an indigo. They're big snakes. Photograph by Chris Lechowicz.

tions laying larger clutches. A long gestation of three to four months must take place at relatively low temperatures: 72–78°F. Prolonged temperatures of 80° will probably be deadly to the embryos.

One of the problems with indigo conservation is their large home ranges. Males' home ranges may be up to 247 acres; females may have half that. While habitat loss is always the number one factor in most species' declines, roads take a tremendous toll on indigos because they move such large distances. The standard suspects such as raptors, raccoons, fire ants, and alligators also take a toll on the snakes, but Chris doesn't think the pet trade is responsible for many wild losses these days.

Starting in 2002, Chris and the Ding Darling National Wildlife Refuge, also on Sanibel Island, conducted a study to determine if indigos



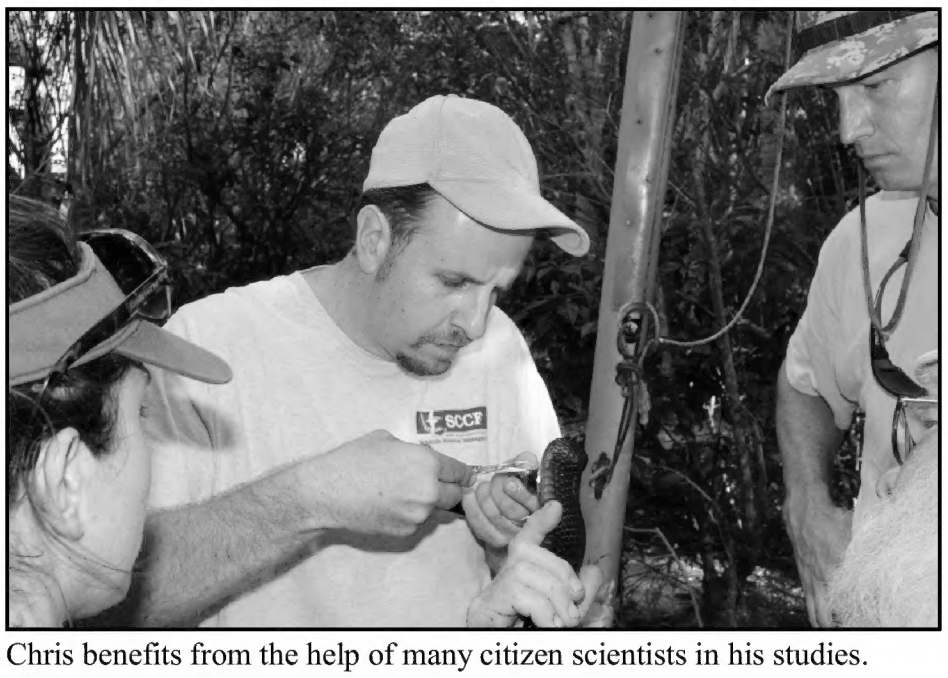
Eggs and a pit tag are easily discernible in this radiograph.

One of the most common snakes in southern Florida, the southern black racer (*Coluber constrictor priapus*), which is often confused with the indigo. Photograph by Daniel Parker.

were still on Sanibel. After a couple of years of intensive searching, none could be discovered. Finally, in 2012 Chris teamed with the Orianne Society to study populations of eastern indigos on the islands surrounding Pine Island Sound. Two of the five islands that Chris has studied have small populations of the snakes. Chris showed us pictures and talked of the methods he is using to conduct these studies. Citizen scientists are his first responders, relaying sightings and helping with measurements, tagging and markings. Through extensive outreach programs, Chris has educated most of the inhabitants of the islands to look favorably on the indigos, but there are still people who refuse to understand the value of these animals. Chris told a sad tale of the killing of the only snake that he had found that made it to a previously indigo-free island.

Chris gave us a little husbandry information for indigos that he's acquired while breeding indigos. Since the origins of the breeding snakes at the SCCF cannot be established, they cannot be used for reintroductions, but Chris distributes the offspring to various educational institutes in South Florida. His method of temperature control of the incubating eggs caused laughter when he explained that he simply opened and closed the door of the closet where he kept the eggs. If it works, don't fix it.

You missed Chris's sharp sense of humor in his slides and talk, his extensive knowledge of indigos, the surrounding islands of Pine Island Sound and Sanibel, his ability to handle people and involve them in his projects, and his slide showing an indigo consuming a hatchling gopher tortoise. You'll have to come to the meeting for all those things. Sorry.



Chris benefits from the help of many citizen scientists in his studies. Photograph by Joel Caouette.

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For sale: **highest quality frozen rodents**. I have been raising rodents for over 30 years and can supply you with the highest quality mice available in the U.S. These are always exceptionally clean and healthy with no urine odor or mixed in bedding. I feed these to my own reptile collection exclusively and so make sure they are the best available. All rodents are produced from my personal breeding colony and are fed exceptional high protein, low fat rodent diets; no dog food is ever used. Additionally, all mice are flash frozen and are separate in the bag, not frozen together. I also have ultra low shipping prices to most areas of the U.S. and can beat others shipping prices considerably. I specialize in the smaller mice sizes and currently have the following four sizes available: Small pink mice (1 day old—1 gm) , $25 /100; Large pink mice (4 to 5 days old—2 to 3 gm), $27.50 /100; Small fuzzy mice (7 to 8 days old—5 to 6 gm), $30/100; Large fuzzy mice / hoppers (10 to 12 days old—8 to 10 gm), $35/100 Contact Kelly Haller at 785-224-7291 or by e-mail at kelhal56@hotmail.com

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NEW CHS MEMBERS THIS MONTH

Rachel Bladow
Annalisa Kolb

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, May 29, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Joe Cavataio** will speak on "Amphibians of the Chicago Region." Joe is a lifelong naturalist with a focus on herpetology, particularly in urban areas and where the natural landscape has been altered by humans. Food scientist during the week and field herper on weekends, he enjoys getting wet and dirty in pursuit of reptiles and amphibians and doing all he can to play a role in conservation. He will share his extensive knowledge Chicago's frogs, toads, and salamanders, including natural history and recent conservation measures aimed at ensuring the long-term survival of these intriguing animals.

The June 26 meeting will be our popular and always well-attended annual **Show & Tell** meeting. Bring an animal that you find interesting for one reason or another and be prepared to give a short (under five minutes) presentation to the group. Don't be shy. Neither age (yours) nor commonness (the animal's) should be a limitation.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

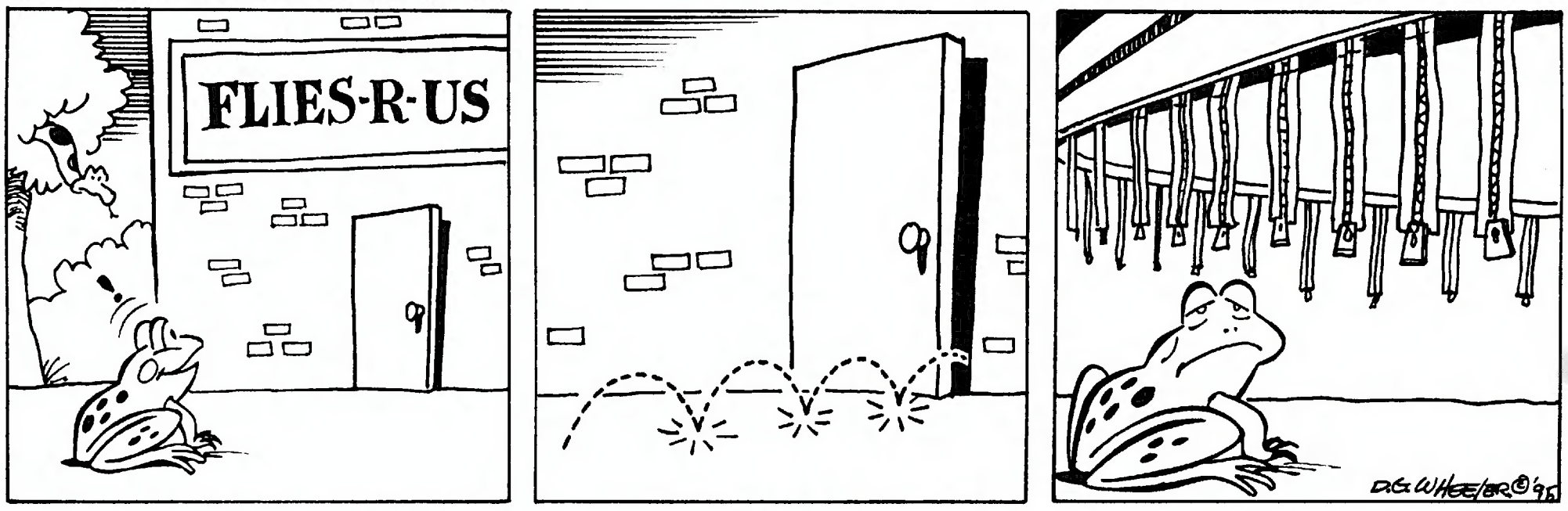
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to take place at 7:30 P.M., June 14, 2019, at Papa Passero's Pizzeria, 6326 S. Cass Ave., Westmont.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

THE ADVENTURES OF SPOT



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